WHAT IS CLAIMED IS:

1. A method for fabricating a thin film on a substrate, which comprises:

   depositing a plurality of nanoparticles initially in a solvent onto said substrate in such a way that said nanoparticles form a monolayer on said substrate; wherein said nanoparticles are coated with an organic surfactant, and wherein said nanoparticles are electrically insulating with relative dielectric constant greater than 10.

2. The method of claim 1, wherein a percentage of said thin film comprised of said nanoparticles is in a range of about 50% to about 100%.

3. The method of claim 1, wherein said nanoparticles have a diameter size in the range between about 2 nm to about 20 nm.

4. The method of claim 3, wherein a distribution of said diameter size in said thin film has a standard deviation selected from the group consisting of: less than 15%, less than 10% and less than 5%.

5. The method of claim 1, wherein said monolayer of nanoparticles is subsequently heated.

6. The method of claim 1, wherein said nanoparticles are composed of a perovskite-type oxide having the formula ABO_3, wherein A is at least one additional cation having a positive formal charge in the range between about 1 to about 3; and wherein B is at least one acidic oxide having a metal selected from the group consisting of: Group IVB, VB, VIB, VIIB, IIIA, and IB.

7. The method of claim 1, wherein said nanoparticles are a pervoskite-type oxide selected from the group consisting of: a titanate-based ferroelectric, a manganate-based material, a cuprate based material, a tungsten bronze-type niobate, tantalate or titanate, or a layer bismuth tantalate, niobate, or titanate.

8. The method of claim 1, wherein said nanoparticles are a ferroelectric material selected from the group consisting of: bismuth titanate, strontium bismuth tantalite, strontium bismuth niobate, strontium bismuth tantalite niobate, lead zirconate titanate, lead lanthanum zirconate titanate, lead titanate, bismuth titanate, lithium niobate, lithium tantalite, strontium rhuthenate, barium titanite, strontium titanate and compositions of these materials modified by incorporation of a dopant.

9. The method of claim 1, wherein said nanoparticles are formed via a non-aqueous chemical process that injects metal oxide precursors at temperatures in a range between about 60° C to about 300° C, or where said precursors are added at low temperature and then heated to between about 60° C and about 300° C.

10. The method of claim 1, wherein said nanoparticles are formed in a predetermined crystalline phase by either synthesizing or heating.

11. The method of claim 5, wherein said heating of said nanoparticles is carried out at temperatures in the range between about 100°C to about 800°C.

12. The method of claim 5, wherein said heating of said nanoparticles is carried out at temperatures in a range between about 300°C to about 650°C.

13. The method of claim 5, wherein said heating of said nanoparticles is carried out using irradiation from a source selected from the group consisting of: laser, microwave, electron beam and ion beam.

14. The method of claim 5, further comprising the step of repeating said depositing and heating steps, thereby increasing thickness of said thin film.

15. The method of claim 1, further comprising the step of depositing said nanoparticles initially in said solvent on a liquid subphase.

16. The method of claim 15, further comprising evaporating said solvent deposited on said liquid subphase, thereby forming said monolayer of said nanoparticles packed closely at a liquid-air interface of said liquid subphase, and wherein said depositing step transfers said monolayer of nanoparticles to said substrate.

17. The method of claim 16, wherein a percentage of said thin film comprised of said nanoparticles is in a range of about 25% to about 75%.

18. The method of claim 5, wherein said heating step removes said surfactant.

19. A thin film fabricated on a substrate by the method which comprises:

depositing a plurality of nanoparticles initially on a solvent onto said substrate in such a way that said nanoparticles form a monolayer on said substrate; wherein said nanoparticles are coated with an organic surfactant, and wherein said nanoparticles are electrically insulating with relative dielectric constant greater than 10.

20. The thin film of claim 19, wherein a percentage of said thin film comprised of said nanoparticles is in a range of about 50% to about 100%.

21. The thin film of claim 19, wherein said nanoparticles have a diameter size in the range between about 2 nm to about 20 nm.

22. The thin film of claim 21, wherein a distribution of said diameter size in said thin film has a standard deviation selected from the group consisting of: less than 15%, less than 10% and less than 5%.

23. The thin film of claim 19, wherein said monolayer of nanoparticles is subsequently heated.

24. The thin film of claim 19, wherein said nanoparticles are composed of a perovskite-type oxide having the formula ABO_3, wherein A is at least one additional cation having a positive formal charge in the range between about 1 to about 3; and wherein B is at least one acidic oxide having a metal selected from the group consisting of: Group IVB, VB, VIB, VIIB, IIIA, and IB.

25. The thin film of claim 19, wherein said nanoparticles are a pervoskite-type oxide selected from the group consisting of: a titanate-based ferroelectric, a manganate-based material, a cuprate based material, a

tungsten bronze-type niobate, tantalate or titanate, or a layer bismuth tantalate, niobate, or titanate.

26. The thin film of claim 19, wherein said nanoparticles are a ferroelectric material selected from the group consisting of: bismuth titanate, strontium bismuth tantalite, strontium bismuth niobate, strontium bismuth tantalite niobate, lead zirconate titanate, lead lanthanum zirconate titanate, lead titanate, bismuth titanate, lithium niobate, lithium tantalite, strontium rhuthenate, barium titanite, strontium titanate and compositions of these materials modified by incorporation of a dopant.

27. The thin film of claim 19, wherein said nanoparticles are formed via a non-aqueous chemical process that injects metal oxide precursors at temperatures in a range between about 60° C to about 300° C, or where said precursors are added at low temperature and then heated to between about 60° C to about 300° C.

28. The thin film of claim 19, wherein said nanoparticles are formed in a predetermined crystalline phase by either synthesizing or heating.

29. The thin film of claim 23, wherein said heating of said nanoparticles is carried out at temperatures in the range between about 100°C to about 800°C.

30. The thin film of claim 23, wherein said heating of said nanoparticles is carried out at temperatures in a range between about 300°C to about 650°C.

31. The thin film of claim 23, wherein said heating of said nanoparticles is carried out using irradiation from a source selected from the group consisting of: laser, microwave, electron beam and ion beam.

32. The thin film of claim 23, further comprising the step of repeating said depositing and heating steps, thereby increasing thickness of said thin film.

33. The thin film of claim 19, further comprising the step of depositing said solution on a liquid subphase.

34. The thin film of claim 33, further comprising the step of evaporating said solvent deposited on said liquid subphase, thereby forming said monolayer of said nanoparticles packed closely at a liquid-air interface of said liquid subphase, and wherein said depositing step transfers said monolayer of nanoparticles to said substrate.

35. The thin film of claim 34, wherein a percentage of said thin film comprised of said nanoparticles is in a range of about 25% to about 75%.

36. The thin film of claim 23, wherein said heating step removes said surfactant.

37. A dielectric thin film with relative dielectric constant greater than 10 comprising a crystalline structure having a relatively narrow grain-sized distribution, wherein said narrow grain-sized distribution has a standard deviation selected from the group consisting of: less than 15%, less than 10% and less than 5%.

38. A capacitor comprising an electrically insulating layer that is sandwiched between first and second electrically conducting electrodes, wherein said electrically insulating layer is formed by the method which comprises:

depositing a plurality of nanoparticles on said substrate in such a way that said nanoparticles form a monolayer on said substrate; wherein said nanoparticles are coated with an organic surfactant, and wherein said nanoparticles are electrically insulating with relative dielectric constant greater than 10, and optionally heating said monolayer of nanoparticles to thereby form said thin film.

39. The capacitor of claim 38, wherein said nanoparticles are formed via a non-aqueous chemical process that injects metal oxide precursors at temperatures in a range between about 60° C to about 300° C.

40. The capacitor of claim 38, wherein said nanoparticles are formed in a predetermined crystalline phase by either synthesizing or heating.

41. The capacitor of claim 38, wherein said method further comprises the step of repeating said depositing and heating steps, thereby increasing the thickness of said thin film.

42. A field effect transistor comprising: a source region and a drain region; a channel region comprising a semiconductor material; an insulating layer of electrically insulating material disposed over said channel region, and a gate electrode overlying said layer of electrically insulating material, wherein said layer of electrically insulating material is formed by the method which comprises:

depositing a plurality of nanoparticles on said substrate in such a way that said nanoparticles form a monolayer on said substrate; wherein said nanoparticles are coated with an organic surfactant, and wherein said nanoparticles are electrically insulating with relative dielectric constant greater than 10; and optionally heating said monolayer of nanoparticles to thereby form said thin film.

43. The field effect transistor of claim 42, wherein said semiconductor material is comprised of an organic material or a hybrid organic/inorganic material.

44. The field effect transistor of claim 42, wherein said nanoparticles are formed via a non-aqueous chemical process that injects metal oxide precursors at temperatures in a range between about 60° C to about 300° C.

45. The field effect transistor of claim 42, wherein said nanoparticles are formed in a predetermined crystalline phase by either synthesizing or heating.

46. The field effect transistor of claim 42, wherein said method further comprises the step of repeating said depositing and heating steps, thereby increasing the thickness of said thin film.

47. The method of claim 1, wherein a percentage of said monolayer comprised of said nanoparticles is in a range of about 50% to about 60%.

48. The method of claim 5, wherein a percentage of said thin film comprised of said nanoparticles is in a range of about 90% to about 100%.

49. The method of claim 16, wherein a percentage of said monolayer comprised of said nanoparticles is in a range of about 50% to about 60%.

50. The thin film of claim 19, wherein a percentage of said monolayer comprised of said nanoparticles is in a range of about 50% to about 60%.

51. The thin film of claim 23, wherein a percentage of said thin film comprised of said nanoparticles is in a range of about 90% to about 100%.

52. The thin film of claim 23, wherein a percentage of said monolayer comprised of said nanoparticles is in a range of about 50% to about 60%.